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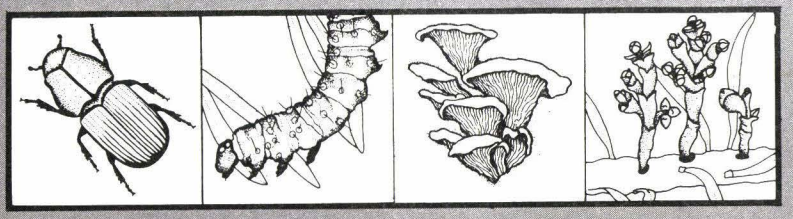

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# EVALUATION OF ROOT DISEASE CONTROL IN THE SAINT MARY'S LOGGING UNIT, FLATHEAD RESERVATION, MONTANA

by

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## ABSTRACT

Two methods attempting to stop marginal spread of a root disease center in Douglas-fir were evaluated within the Flathead Indian Reservation, Montana. The first method was to cut all living trees within a 1-chain strip outside the edge of the infestation. The second method was to uproot all trees for 1 chain outside the edge. Neither method appeared to effectively restrict marginal spread of root disease because black stain (Ceratocystis wageneri) was present in nonsymptomatic trees beyond the treated area. Accurate diagnosis of organisms involved in root disease is a prerequisite to successful silvicultural treatments.

## INTRODUCTION

A group of dead and dying Douglas-fir (Pseudotsuga menziesii Franco) was spotted from the air in the lower portion of St. Mary's unit (T. 17 N., R. 19 W., 1/2 sec. 4 - Flathead Reservation, Montana) in the spring of 1979. Steve Haglund, forester, Bureau of Indian Affairs, subsequently examined the group on the ground, and recognized it as a root disease center.

USDA-Forest Service plant pathologists visited the area later in 1979 and again in 1980. Examination of the root crowns of dead and declining trees showed presence of Armillaria mellea (Vahl. ex Fr.), the cause of Armillaria root disease. The center was about 15 acres in size and had a well-defined margin. It appeared to be an ideal location for testing methods to control root disease spread. Such a test was established in the spring of 1980. This paper describes the test, gives early results, and discusses their implications.

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## METHODS

The root disease center was in an 80-year-old stand, composed primarily of Douglas-fir, at about 1,097-meter (3,600 feet) elevation. Two methods for evaluating marginal spread were tested. The first was to cut all living trees in a 1-chain-wide strip outside the edge of the infestation. The edge of the strip was located along a line drawn between the border trees that were dead or exhibited crown symptoms. The intent was to create a 1-chain "buffer zone" of stumps in which nonpathogenic fungi would decay the root systems and block root-to-root spread of the pathogen. The second control method was to uproot all trees for 1 chain outside the infestation margin, also with the intent of preventing root-to-root spread. The test consisted of dividing the infestation margin, as defined by trees with crown symptoms, into nine segments ranging from 67 m to 151 m (220-495 feet) in length and assigning three segments to each of the two treatments and three to uncut checks. Eight trees located on and near the infestation margin were pushed over with a D-6 tractor to expose their root systems prior to establishment of the test. Root systems were examined to determine whether A. mellea extended more than 1 chain into the stand from the center margin.

Root systems of these trees, and those of nondeclining trees excavated to create the 1-chain buffer strips, were also examined for symptoms of other root pathogens.

The test site was revisited in September 1980 and again in May 1981. Trees outside the disease control strips were examined for symptoms of decline and signs of root disease.

## RESULTS AND DISCUSSION

Douglas-fir on the margin of the infestation exhibited crown symptoms that are associated with root damage. Symptoms included (1) loss of needles and thinning of the crown, (2) foliage chlorosis, and (3) stress cone crops. Fungal mats and root decay typical of A. mellea were present on declining trees. However, trees without crown symptoms located adjacent to declining trees were apparently free of A. mellea infection; no A. mellea was found on any of the symptomless trees that were excavated. The 1-chain-wide strip was apparently wide enough to stop marginal spread of A. mellea. However, close examination of roots smaller than about 2.5 cm (1 inch) in diameter indicated that A. mellea was not the only pathogen present in several of these trees. Sapwood of several roots contained black or brown streaks indicative of black stain root disease caused by Ceratocystis wageneri Goheen and Cobb (4). About 40 percent of the symptomless trees within the 1-chain test strip also contained black stained roots. Cultural examinations and greenhouse studies (1) confirmed presence of the Verticicladiella state of C. wageneri in stained roots.

In September, black stain was found on four nonsymptomatic Douglas-fir beyond the treatment edge. Several trees near the treated disease center had begun to fade, indicating presence of root disease.

## CONCLUSION

A combination of two root pathogens appears to be the cause of the disease within the St. Mary's unit. Black stain apparently infests trees prior to colonization by A. mellea. Such associations have been reported elsewhere (2,3) and may indicate successional patterns of root infection by different organisms during the course of disease development.

Within the test area, removal of stumps and root systems within a 1-chain strip of the infestation margin failed to stop disease spread. Apparently, black stain root disease was already present in symptomless trees located outside the strip when the test was established.

## ACKNOWLEDGMENTS

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## LITERATURE CITED

1. Byler, J. W., T. Harrington, S. Haglund, R. E. Williams, and R. L. James. 1981. Black stain root disease on Douglas-fir in Western Montana. Plant Disease (In preparation).

2. Goheen, D. L., and E. M. Hansen. 1978. Black stain root disease in Oregon and Washington. Plant Disease Reptr. 62(12):1098-1102.

3. James, R. L., and J. W. Byler. 1981. Evaluation of root disease on the Ducharme logging unit, Flathead Indian Reservation. USDA-Forest Serv., Northern Region, Rept. 81-4, 5 p.

4. Smith, R. S., Jr. 1978. Root disease. p. 142-156. In diseases of Pacific coast conifers, USDA-Forest Serv. Agr. Hdbk. 521, 206 p.